

CONTRIBUTIONS FROM LOS ANGELES COUNTY
MUSEUM—CHANNEL ISLANDS BIOLOGICAL
SURVEY

No. 34. SOME OBSERVATIONS ON THE LAND SNAILS
OF SAN CLEMENTE ISLAND

By GEORGE P. KANAKOFF

The material on which these observations are based was collected by the writer during two expeditions made by the Los Angeles Museum Channel Islands Biological Survey, and is compiled from notes made at that time.

The first of these two trips was Expedition No. 5, when the Museum party camped at Smugglers' Point in Pyramid Cove, at the southeast end of San Clemente Island, from November 8 to December 10, 1939. The second trip was Expedition No. 12, when the Museum party camped at Horse Beach Cove near China Point at the southwest of the island, from February 14 to 22, 1941.

As conditions permitted, collecting was done within a ten-mile radius of each camp, and additional collecting was done in the central parts of the island in the vicinity of Middle Ranch, and more to the north at the "Emergency Landing Field," and finally at the northern part of the island in the vicinity of the Naval Training Base at Wilson's Cove, during short intervals, while preparing to land or embark from the island.

As the invertebrate zoologist of the party, the writer, among other material, collected the following species of the land snails:

LIVING:

ENDEMIC

<i>Micrarionta intercisa</i> (W. G. Binney).....	1535	specimens
<i>Micrarionta redimita</i> (W. G. Binney).....	465	"
<i>Micrarionta redimita f. hybrida</i> (Hemphill).....	31	"
<i>Micrarionta gabbi</i> (Newcomb).....	226	"
<i>Micrarionta gabbi f. maxima</i> (Pilsbry).....	73	"
<i>Sterkia clementina</i> (Sterki).....	6	"

NONENDEMIC SPECIES

<i>Succinea awara</i> (Say).....	120	"
<i>Vertigo californica longa</i> (Pilsbry)	71	"

FOSSIL:

<i>Micrarionta intercisa</i> (W. G. Binney)	80	"
<i>Micrarionta redimita</i> (W. G. Binney)	260	"
<i>Micrarionta redimita f. hybrida</i> (Hemphill)	180	"
<i>Micrarionta redimita f. inconstans</i> (Hemphill) ..	12	"
<i>Micrarionta gabbi f. maxima</i> (Pilsbry)	69	"
<i>Micrarionta</i> sp. nov. hereinafter described.....	120	"

Altogether the source material consists of 69 lots from 31 localities. This paper is concerned with observations on *Micrarionta intercosa*, *Micrarionta redimita*, their numerous described "forms" and "varieties," together with the description of a new species of the same genus from a fossil deposit, which the writer believes to be an ancestor of the above named species and of their variations.

In examining various lots of this genus, it is easy to tell at a glance whether they are from the northwestern, central or south-eastern portion of the island. The climatic conditions and rainfall are in striking contrast; the northwestern part of the island from the Isthmus to Mosquito Cove in a long narrow triangular strip has comparatively abundant vegetation and more rainfall, and is for many days of the year under a blanket of fog, whereas the southwestern larger triangular portion of the island is almost bare of vegetation and arid, the middle ribbonlike strip in between partakes of the climatic characteristic of both. At the larger, southwestern portion of the island a few shrubs, cacti, and a few grasses are found only in the deep canyons and gulleys, the top

San Clemente Island

Legend

- | | |
|------------------------|------------------------|
| 1. Northwest Harbor | 11. Horse Beach Cove |
| 2. Wilson's Cove | 12. Smugglers' Cove |
| 3. Landing Field | 13. Horse Beach Canyon |
| 4. Middle Ranch | 14. Smugglers' Canyon |
| 5. Middle Ranch Canyon | 15. Windmill Gulch |
| 6. Cave Canyon | 16. Pyramid Cove |
| 7. Red Canyon | 17. Pyramid Head |
| 8. China Canyon | 18. Mosquito Cove |
| 9. China Point | 19. Horse Canyon |
| 10. Zilch Island | 20. Big Dam Canyon |
| | 21. Chinetti Cove |

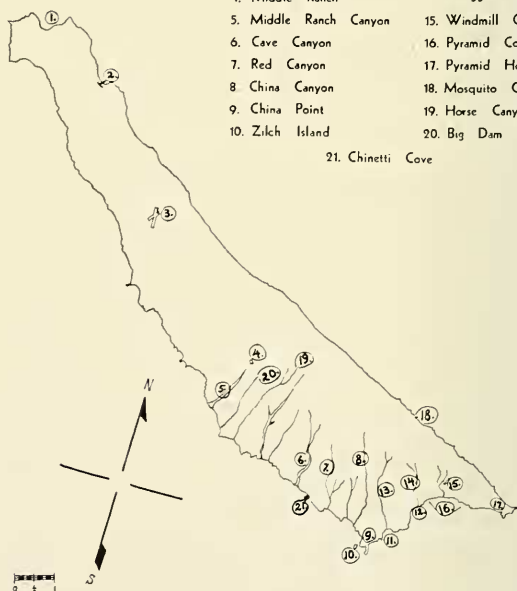


PLATE 26

of the island main plateaux being mostly bare, and in the extreme south end subject to a continuous denudation and sand-blasting. The masses of Miocene sandstones and breccia towering above the canyons here and there are concealed in their lower portion by a light-gray blanket of volcanic tuff from 5 to 50 feet deep. These cliffs, above, where they catch some moisture from the night fog are covered in spots with mosses and lichens, and in the crevices harbor the largest colonies of *M. redimita* and *M. intercisa*. The northeastern lots of these two species have most of the specimens of larger, wider dimensions, with thinner walls and of a brighter color. The southwestern specimens, on the other hand, show a greater variation, having a higher spire, being half as large in diameter, are of bleached appearance, with thick walls and calluses. But one finds a few southern forms in the northern lots, although the northern large forms do not occur elsewhere on the island.

Having at his disposal a particularly long series of *M. intercisa*, the writer experimentally separated this material into groups to match the previously described "forms" and "varieties" of that species in order to illustrate and biometrically to evaluate their validity, with the following results:

Micrarionta intercisa ss

300 specimens were selected from three localities ranging from Airfield to Pyramid Peak—all like the holotype. (W. G. Binney, 1857.)

Micrarionta intercisa form *albida*

"Uniform milk-white, sometimes with a faint band at the periphery; sculpture nearly obsolete . . ." (Hemphill, 1891.)

34 specimens were selected from six sources coming from Middle Ranch Canyon and five southern localities.

Micrarionta intercisa form *callojunctis*

A fossil form:

"Peristome thickened strongly, continuous in a raised ledge across the parietal wall." (Pilsbry, 1939.)

The writer failed to match perfectly more than one specimen (No. 27, Lot 464-39) with the holotype kindly sent by Dr. H. A. Pilsbry (ANSP No. 10806) and was unable to draw any line between this and many apparently intergrading specimens from this fossil lot.

Micrarionta intercisa form *crebristriata*

"... peristome narrowly expanded, thinner than in *M. intercisa* proper, having but little thickening within, the columella con-

cave or slightly straightened, not toothed. Umbilicus nearly covered." (Newcomb, 1864.)

214 specimens were selected from two sources ranging from Northwest Harbor to Middle Ranch Canyon. This is the largest *geographical race* of the species. In the Middle Ranch Canyon lots it begins to intergrade with the southern forms.

"Micrarionta intercesa form ductor"

A fossil form:

"Lip and parietal callus moderately thick, the latter adnate; size large, 25.5 by 20.0 mm., $5\frac{1}{2}$ whorls." (Hemphill in Pilsbry, 1939.)

After a careful examination of the two specimens sent by Dr. H. A. Pilsbry (ANSP No. 86748) the author is convinced that this is a case of misnomer or a typographical error. The two specimens closely matching our specimens (No. 1, Lot 464-39, and No. 22, Lot 528-39) are undoubtedly a form of *M. redimita* (W. G. Binney): Our specimens are extremely close to *M. redimita* form *hybrida*. Hemphill in Pilsbry, 1939.

It is interesting to mention here that a remnant of a deposit, very much resembling Upper Pleistocene (Palos Verdes Sand) was found on the little island 350 yards to west of southwest off of China Point, marked on some maps as Zilch Island. In nine pounds of screenings, consisting of a marine shell deposit, several land snails were found, larger than but very closely fitting this form. (Op. Cit. figs. "h" and "i.")

Micrarionta intercesa var. *elegans*

"Uniform ashy-buff color, faintly banded and variable in form." (Hemphill, 1891.)

75 specimens were selected to match this color form ("Pale Congo Pink" by Ridgeway) from four sources ranging from Wilson's Cove to China Point. It was the author's observation that where there was less protection from light (on rocks) this color form predominated and the specimens collected under thick layers of cacti (*Opuntia littoralis*) had more color the deeper they were buried.

Micrarionta intercesa var. *minor*

"Smallest specimen, greatest diameter 18 mm., altitude, 11 mm. uniform light-yellowish chestnut color, with and without a band and varies very much in form and elevation or depression of spire." (Hemphill, 1891.)

This is a typical stunted form of the species so abundant in the southern portion of the island. 160 specimens were selected from Windmill Gulch.

Micrarionta intercosa var. *nepos*

"... uniform ashen-white; spire horn color, variable in form and sculpturing ..." (Hemphill, 1891.)

The first two to four whorls in color match "Pale Vinaceous-Fawn," and "horn" (of Hemphill) matches "Russell-Vinaceous," both of Ridgeway.

140 specimens were selected from two sources of the southern portion of the island.

Micrarionta intercosa form *puer*

A fossil form:

"Small, diameter 15 to 20 mm., often angular at periphery." (Hemphill in Pilsbry, 1939.)

123 specimens were selected from three sources of southernmost localities of the island. After examining long series of this form and living var. *minor*, the author is convinced that this fossil form is an ancestor of the living var., as they are found to intergrade structurally.

In the course of Expedition No. 5, during December, 1939, while on the southern slope of the small volcanic hill at the southwestern end of China Point, the author secured a lot of 28 shells unearthed by the rapid denudation. Intrigued by their large size and curious about the source of these shells, which were scattered on the west-southwestern portion of the slope, the writer, on December 6, undertook an excavation, and in a trench on the side of the slope made from the top downward, uncovered, after a day of digging, a stratum of a dark-gray coarse sand with over 700 shells of land snails imbedded in it. This stratum was from 2 to 3 inches in thickness and about 9 feet long. It was perfectly horizontal and was imbedded at half way up the hill, exactly 250 feet above sea level. The dark-gray stratum was in striking contrast with the light whitish-gray color of the fine volcanic tuff of the matrix of which the whole hillock was built; both the stratum and the matrix were strewn and imbedded throughout with two kinds of rocks, namely, shaly with sharp edges and triangular-rounded. The first assumption that this stratum represented Lower Pleistocene (Lomita Marl Formation) had to be abandoned because no confirming factors could be found. It could be a land laid stratum of the same epoch. According to Lawson, Cooper and Smith* it could be some "Post Pliocene" deposit only. Judging by the traces of color on some of the specimens, the writer believes that it belongs to Upper Pleistocene or later time. Each time the wind blew, the hillock was sand-blasted and the impression given was that it was melting away from day to day.

The lot (A. 4616-464-39) collected there was composed of over

700 specimens, containing 120 specimens of a different species from anything else found on the island.

Dr. H. A. Pilsbry, quoting Holder, 1910*, mentions fossil forms of *M. intercisa* and those of *M. redimita* as an "abundant fossil of the sand dunes." These same statements were made by earlier writers, unfortunately none of them indicating any fossil localities.

The sand dunes of most of the Channel Islands and especially of San Miguel, San Nicolas, Santa Catalina and San Clemente are thickly covered with dead, bleached and sandblasted shells of both land and marine snails and marine clams. The writer has observed that one of the main sources of this debris is the abundant kitchen midden material, removed from mounds by a continuous process of denudation.

However, the secured lot of fossil (or subfossil?) extinct shells excavated from the stratum mentioned above (disregarding the similar material found loose in the vicinity) is a uniform species and distinct from all the species, "forms" and "varieties" described previously from the island. It is the writer's conviction that this



PLATE 27

species is an important link with the past in the chain and is the direct ancestor of *M. intercisa* and *M. redimita* with all their variations. Therefore it is being hereby placed on record as:

MICRARIONTA (XERARIONTA) AGNESÆ sp. nov.

(Plate 27)

DESCRIPTION:

Shell large for the genus, grayish-white, whorls 5, depressed-globose, bicolored; the two embryonic whorls smooth, later gradually become obliquely striated; after the third whorl striation becomes coarser and reaching the body whorl it becomes fine axial malleation, crossed at 35 degrees by the lines of growth; the outer lip faintly toothed or smooth, wide, oval, thick and descending in front; body whorl with a slight trace of a darker color on the upper third of it; sutures rather deep and wavy; the spire but slightly elevated; the second nuclear whorl being the highest; umbilicus wide, partly covered by moderately thick peristome, which is slightly expanded; parietal callus thin or wanting. Greater diameter 32.27, lesser diameter 25.32; greater altitude 21, lesser altitude 15.5; lip length 16.5, lip width 14.5 mm.

The holotype No. 1088 is in Los Angeles County Museum, Division of Invertebrate Paleontology.

This shell is named *Micrarionta agnesæ* in honor of Mrs. Agnes C. Boynton, in token of the deep respect and admiration of the author for her lifelong and untiring love for natural history.

DISCUSSION:

The large size and comparative thinness of this shell suggest a moist climate and abundance of food similar to conditions at the northernmost end of the island at the present time. In these characters and in sculpture it resembles the northern larger form of *M. intercisa* (form *crebristriata*); by its depressed shape it resembles *M. redimita* and is in striking contrast with the existing stunted, high-spined forms of this species which are found in abundance in the southwestern part of the island. In general appearance (except for size) *M. agnesæ* strongly resembles *M. indiænsis xerophila* Berry, but its large size makes it impossible to mistake it for any other species.

This discussion is based on a lot of 120 perfect or nearly perfect specimens collected in the China Point deposit in situ. The typical small race of *M. intercisa* collected at 12 localities between China Point and Pyramid Head exhibits the following measurements:

(Absolute Mean, based on 400 specimens)

Greater diameter	22.2 mm.
Lesser diameter	18.8 mm.
Height	16.7 mm.
Lip length	9.2 mm.
Lip width	9.5 mm.

The northern race of this species measures:

(M. intercosa form crebristriata)

Greater diameter	from 19 to 26 mm.
Lesser diameter	from 17 to 22 mm.
Height	from 16 to 20.5 mm.

BIOMETRIC STUDY

All specimens from the island were counted, numbered and measured. Experimentally the following measurements were used:

1. Greater diameter
2. Lesser diameter
3. Lesser altitude

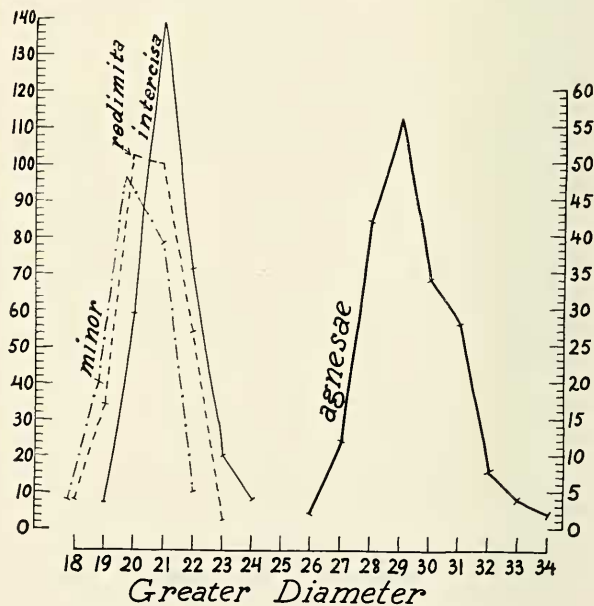


PLATE 28

4. Length of aperture
5. Lesser width of aperture
6. Greater width of aperture
7. Greater altitude

and following ratios were calculated:

8. Ratio 1:7
9. Ratio 4:6
10. Ratio 2:3

The accompanying plates, 28 to 31, show some measurements and the curves resulting from the measurements and their ratios. The many curves were set experimentally and have proved to be unexpectedly interesting, although some of them appear to have more significance than others.

It appears from the curves made on all measurements and ratios of *M. intercosa* and all of its "forms" and "varieties" that they overlap each other to such an extent that reproduction of such a

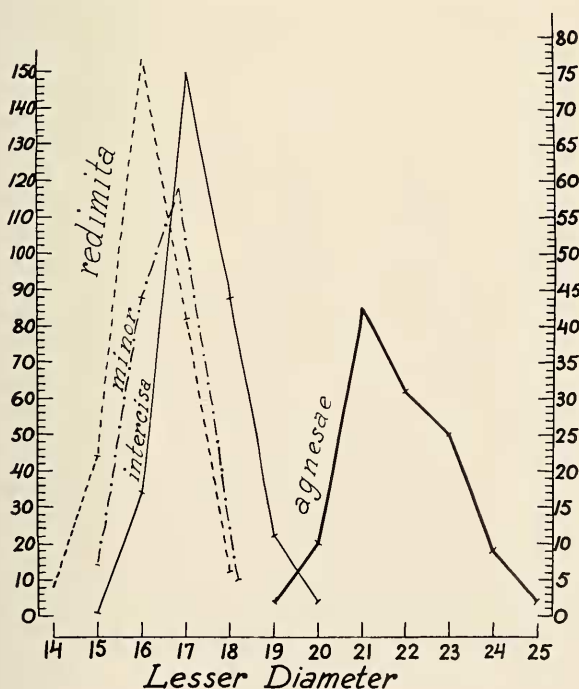


PLATE 29

diagram would look confusing and incomprehensible. It has, however, one exception in the variety *minor* in living and the form *puer* in fossil material. These two have a curve of their own different from the rest. As it is the writer's conviction that the former is a direct descendant of the latter, the sets of curves selected for this paper include var. *minor* in comparison with *M. intercesa*, *M. redimita* and their ancestor, *M. agnosa*.

The writer refrains from premature conclusions of the significance of such biometric curves, but merely points out that the shape of the curve in Ratio 1:7 (greater diameter to greater altitude) repeats also in the curves of the other measurements for each species. *M. agnosa*, for instance, has constantly a "hip" on the right side of the curve; *M. intercesa* and its var. *minor* (which in the author's opinion rates a subspecific status) repeat a pyramidal-shaped curve, and, finally, *M. redimita* repeats a blunt-spined curve.

Whenever opportunity offers a sufficiently long series, the writer feels that many conclusions that are biased by personal opinion or faulty interpretation can be eliminated, improved or corrected by systematic accumulation of this kind of statistical material.

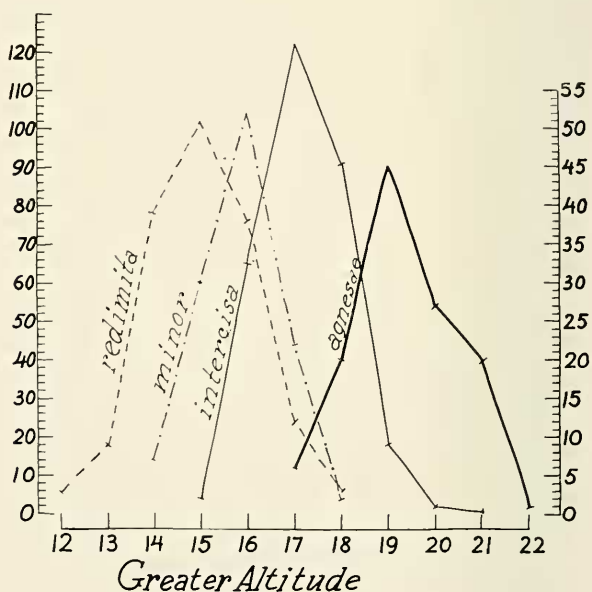


PLATE 30

*LITERATURE

1851—A. Binney, Terr. Moll., 1:330.
1851—A. Binney, Terr. Moll., 2:120.
1857—W. G. Binney, Proc. Acad. Nat. Sci. Phila., p. 18
1858—W. G. Binney, Proc. Acad. Nat. Sci. Phila., p. 187
1864—Newcomb, Proc. Calif. Acad. Sci., 3:116.
1891—Hemphill, Zoe, 1:334.
1893—Lawson, Bull. Dept. Geol. Univ. Calif., v. 1, No. 4, pp. 135-139.
1895—Cooper, 15th Ann. Rep. U. S. G. S., p. 472.
1896—Campbell, Jour. Geol., v. 4, No. 5, p. 580.
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1900—Dall, Proc. Acad. Sci. Phila., p. 103.
1910—Holder, The Channel Islands of Calif., Chicago, A. C. McClurg & Co.
1939—H. A. Pilsbry, Monographs, No. 3, v. 1, pt. 1, pp. 218-225.

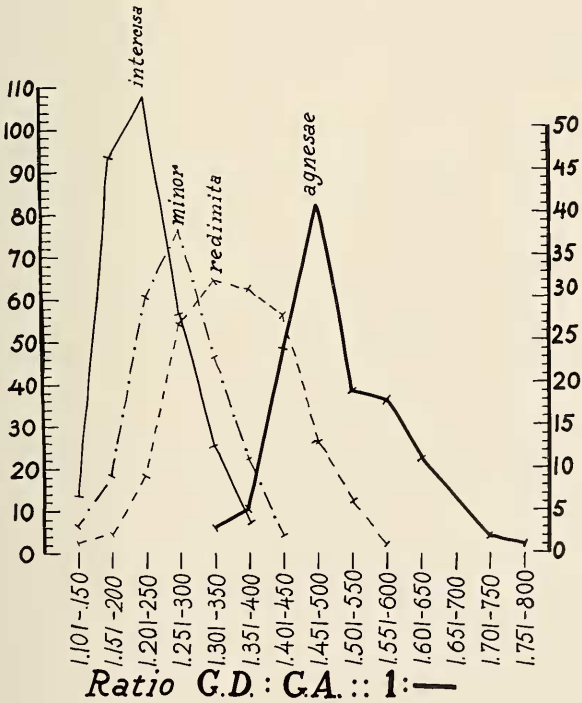


PLATE 31